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Fermi National Accelerator Laboratory
Batavia, IL 60510

CMS ME1/2 ANODE PANEL ELECTRICAL TESTING TRAVELER

Reference Drawing(s)

Endcap Muon Chamber ME1/2 Final Assembly
5520-ME-368120

Endcap Muon Chamber Anode Panel Assembly
5520-ME-368121

Budget Code: **Project Code:**

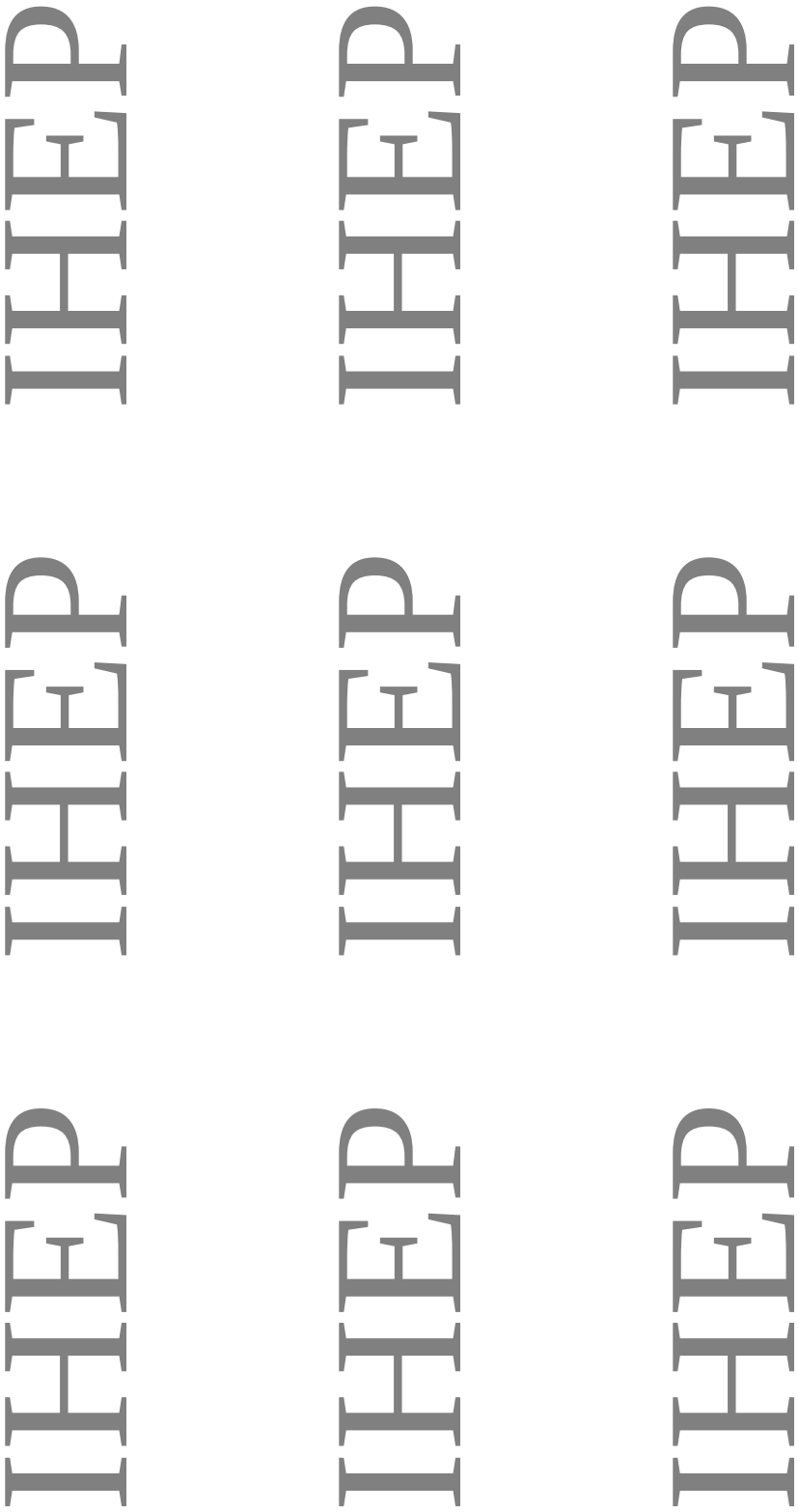
Released by: **Date:**

Prepared by: M. Hubbard, B. Jensen, L. Lee

Title	Signature	Date
TD / E&F Process Engineering	**Bob Jensen/Designee**	
TD / E&F CMS Assembly	**Glenn Smith/Designee**	
TD /E&F Technological Physicist	**Oleg Prokofiev/Designee**	
TD / E&F CMS Project Manager	**Giorgio Apollinari/Designee**	

Revision Page

Revision	Step No.	Revision Description	TRR No.	Date
None	N/A	Initial Release	N/A	04/26/00



Ensure appropriate memos and specific instructions are placed with the traveler before issuing the sub traveler binder to production.

1.0 General Notes

1.1 White (Lint Free) Gloves (Fermi stock 2250-1800) or Nitrile Gloves (Fermi stock 2250-2040) shall be worn by all personnel when handling all product parts after the parts have been prepared/cleaned.

1.2 All steps that require a sign-off shall include the Technician/Inspectors first initial and full last name.

1.3 No erasures or white out will be permitted to any documentation. All incorrectly entered data shall be corrected by placing a single line through the error, initial and date the error before adding the correct data.

1.4 All Discrepancy Reports issued shall be recorded in the left margin next to the applicable step.

1.5 All personnel performing steps in this traveler must have documented training for this traveler and associated operating procedures.

1.6 Personnel shall perform all tasks in accordance with current applicable ES&H guidelines and those specified within the step.

1.7 Cover the product/assembly with Mylar when not being serviced or assembled.

1.8 Never hand/pass anything over a panel as dropped items may damage the panel.

2.0 Parts Kit List

2.1 Attach the completed Parts Kit for this production operation to this traveler. Ensure that the serial number on the Parts Kit matches the serial number of this traveler. Verify that the Parts Kit received is complete.

_____ _____

Process Engineering/Designee Date

3.0 Panel Preparation

Completed

3.1 Acquire the Anode Panel (ME-368121) as per the Panel Serial Number at the bottom of this traveler. Put the Anode panel on transportation cart and move to electrical test area. ❒

3.2 Rotate the panel until in the vertical position. Clean the entire panel (both sides) with ionized nitrogen hand airgun (MX- ????) to remove any dirt, dusts, and other foreign material on the panel ❒

Note(s):

Extreme care must be used while using the Ionized Nitrogen Hand Air Gun to prevent damage to the Anode Panel Wires.

Safety Glasses must be worn while using the Ionized Nitrogen Hand Air gun.

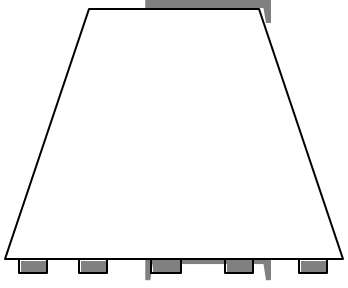
3.3 Inspect the Anode panel (both sides) to be sure that all pieces of wire, dust and foreign materials removed from the panel surface. ❒

_____ _____

Technician(s) Date

4.0 Cathode Strip Resistance tests

4.1 Using a Multimeter, and a Toggle Switch Box, check the continuity in resistance of the cathode strip connectors. Starting with the connector left of the serial number, test each connector and if it passes, check it off in the chart below. If it fails, write the resistance value in the "Fail" box.



Note(s):

All measurements must be within the range of 0.9 – 1.1 Meg Ohm.

	Pass	Fail
Connector #1		
Connector #2		
Connector #3		
Connector #4		
Connector #5		

Remarks:_____

Note(s):

After measurements are completed inform supervisor of any failures.
If all strips pass, panel is acceptable to continue.

_____ _____

Technician(s) Date

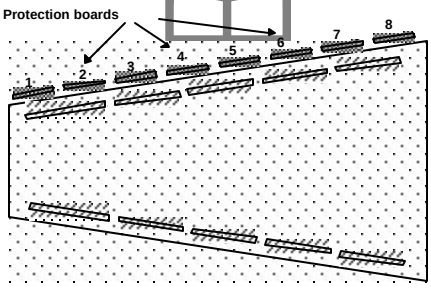
5.0 Anode Wire Group Capacitance Measurements

5.1 Using a Capacitance Measuring Unit, measure the anode wire group capacitance from the protection boards. Measuring will be start from the narrow side of panel.

Note(s):

After measurements are completed inform supervisor of any discrepancy with reference data table with the capacitance measurements.

Be sure that cathode connectors on the box are terminated to ground.



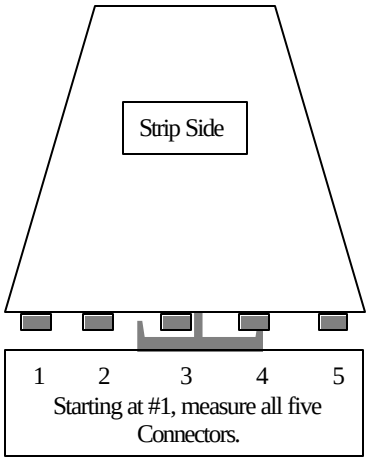
		Protection Board								Replaced
		1	2	3	4	5	6	7	8	
CHANNEL NUMBER	1									
	2									
	3									
	4									
	5									
	6									
	7									
	8									
	9									
	10									
	11									
	12									
	13									
	14									
	15									
	16									
Range: LOW? HIG										

Remarks: _____

Technician(s) Date

6.0 Strip to Ground Capacitance Measurement

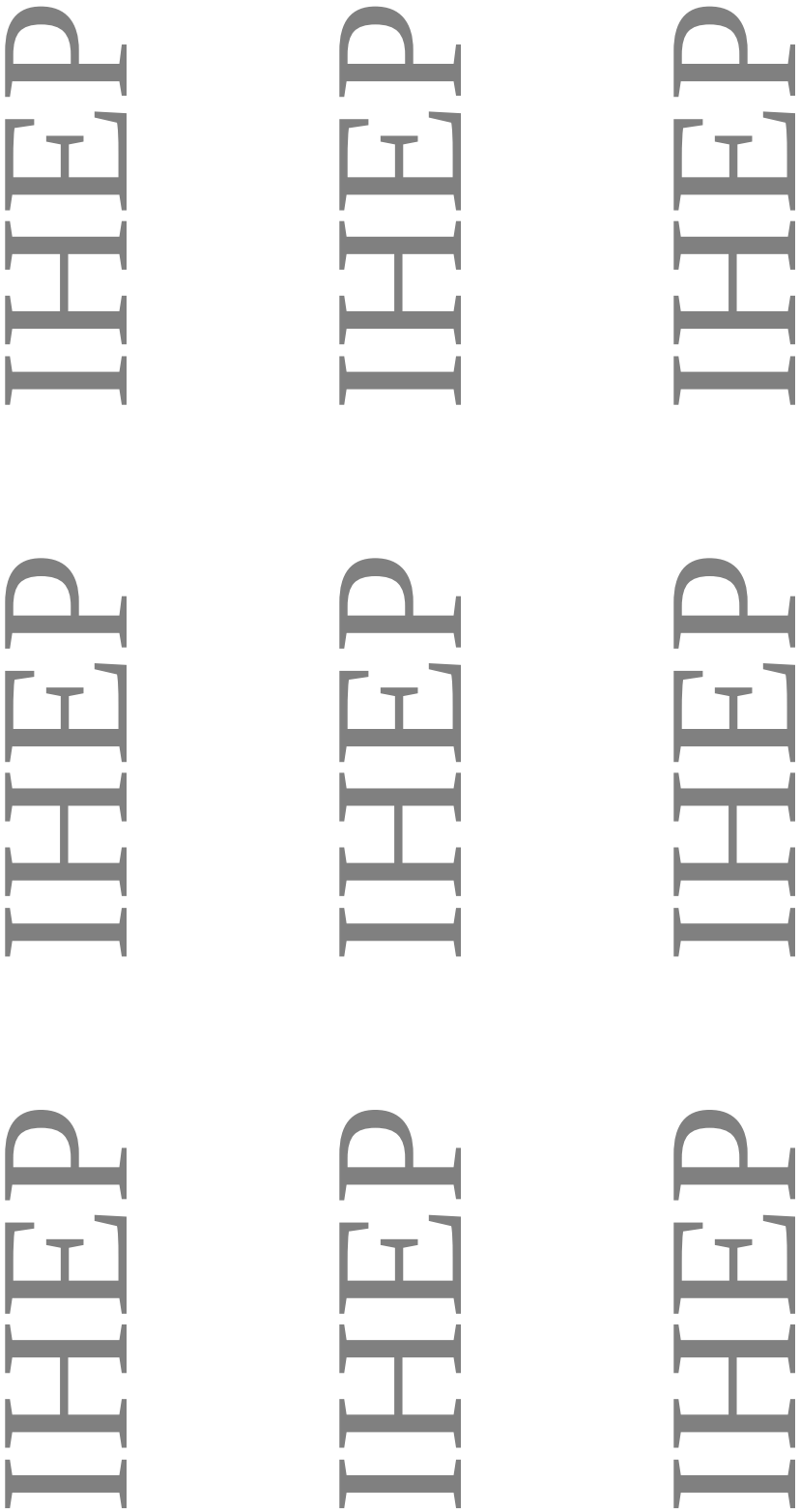
6.1 Using a switch box, cable and LCR meter, measure the Capacitance from Strip to Ground.



		Cathode Connector				
		1	**2**	**3**	**4**	**5**
CHANNEL NUMBER	**1**					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
Range: LOW? HI						

Remarks: _____

Technician(s) Date



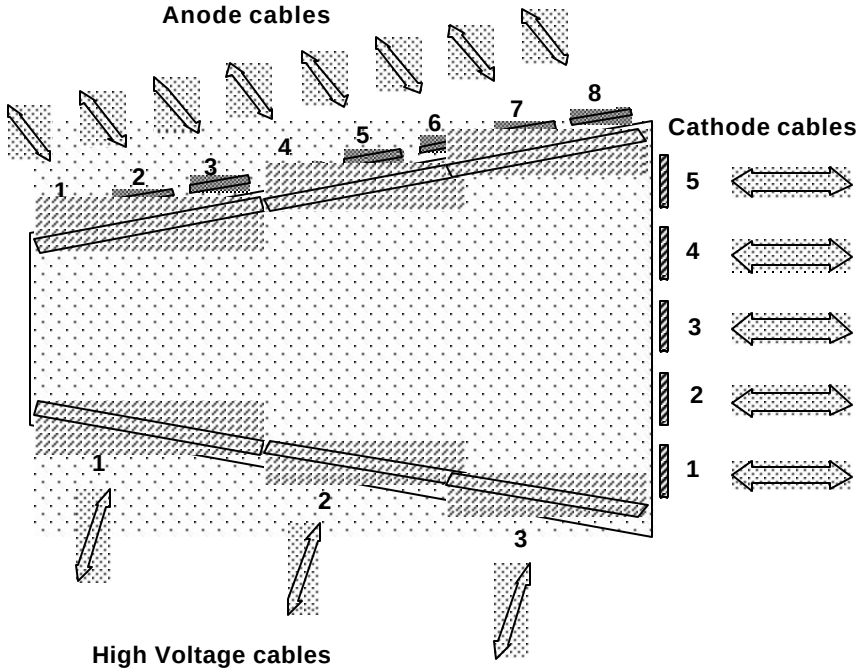
7.0 High Voltage Tests

Completed

7.1 Transport the Anode panel to the High Voltage Test station. ❒

7.2 Install the Anode Panel into the High Voltage Test Box. In accordance with below diagram, connect test cables to the following:

Protection Boards (Anode Cables #1 - #8) ❒
Cathode connectors (Cathode Cables #1 - #5) ❒
High Voltage banana plugs (High Voltage Cables #1 - #3) ❒



Technician(s) _____ Date _____

7.3 Close the box, tighten the seal bolts and open valve with dry air. Purge dry air through the box for approximately 10 - 15 minutes until the humidity will drop to 30% or less. Record the start humidity and the ending humidity.

Time	Humidity %
Start	
Finish	

Technician(s) _____ Date _____

7.4 Switch on the High Voltage Power Supply. Slowly raise the High Voltage up to 1.0 kV and allow the value to stabilize for 2-3 minutes. After the value is stable, record it on the chart below. Continue to increase the voltage to the next HV point, allowing the value to stabilize for 2-3 minutes each time, and record the data for the values onto the chart up to and including 4.5 kV.

High Voltage: Test #1

	Strip Side				Non-Strip Side			
HV (kV)	**I (mA)**	**Start Time**	**Stop Time**	**Humidity %**	**I (mA)**	**Start Time**	**Stop Time**	**Humidity %**
1.0								
2.0								
3.0								
3.5								
4.0								
4.1								
4.2								
4.3								
4.4								
4.5								

Remarks:_____

Note(s):

If a problem arises, lower the kV to ZERO.

All measured current data will be lower than 1 µA. After all measurements are completed inform supervisor of any discrepancy with reference data table.

Technician(s)_____ Date_____

7.5 Perform High Voltage: Test #2 only if discrepancies occurred in Step 6.4 and repairs were required.

High Voltage: Test #2

	Strip Side				Non-Strip Side			
HV (kV)	**I (mA)**	**Start Time**	**Stop Time**	**Humidity %**	**I (mA)**	**Start Time**	**Stop Time**	**Humidity %**
1.0								
2.0								
3.0								
3.5								
4.0								
4.1								
4.2								
4.3								
4.4								
4.5								

Remarks:_____

Note(s):

Note(s):

If a problem arises, lower the kV to ZERO.

All measured current data will be lower than 1 µA. After all measurements are completed inform supervisor of any discrepancy with reference data table.

_____ _____

Technician(s) Date

7.6 Keep plane under HV=4.5kV ±.005kV for about 3-5 minutes. Measure current from each HV segment at 4.5 kV ±.005kV. Record data into below table.

Segment Number

	All Segments	**1**	**2**	**3**	**4**	**5**	**Humidity**
Plane #1 Strip Side	µA	µA	µA	µA	µA	µA	%
Plane #2 Non-Strip Side	µA	µA	µA	µA	µA	µA	%

Note(s):

All measured current data from segment will be lower than 0.1 µA.

After measurements are completed inform supervisor of any discrepancy with reference data table.

Technician(s) Date

Completed

7.7 If the current in any segment is less than 0.1 µA, inspect and clean the wires with ionized air or Ethyl Alcohol (Fermi Stk. No. #1920-0600) and a low-lint wipe (Fermi Stk No. 1660-2500). Then repeat test from 6.6 and record data in following chart. ❒

Segment Number

	All Segments	**1**	**2**	**3**	**4**	**5**	**Humidity**
Plane #1 Strip Side	µA	µA	µA	µA	µA	µA	%
Plane #2 Non-Strip Side	µA	µA	µA	µA	µA	µA	%

Note(s):

All measured current data from segment will be lower than 0.1 µA.

7.8 Decrease the HV slowly to 0 Volts and switch off High Voltage Power Supply. Close air gas manifold. ❒

7.9 Loosen the bolts and remove anode panel. ❒

7.10 Install panel on the panel cart and transport panel to the storage area. ❒

Technician(s) Date

8.0 Production Complete

8.1 Process Engineering verify that the CMS ME1/2 Anode Panel Electrical Traveler (5520-TR-333377) is accurate and complete. This shall include a review of all steps to ensure that all operations have been completed and signed off. Ensure that all Discrepancy Reports, Nonconformance Reports, Repair/Rework Forms, Deviation Index and dispositions have been reviewed by the Responsible Authority for conformance before being approved.

Comments:

Process Engineering/Designee Date

9.0 Attach the Process Engineering O.K. to Proceed Tag to the device this production operation performed.

Process Engineering/Designee Date

10.0 Proceed to the next major assembly operation.

Process Engineering/Designee Date